DOCUMENT RESUME

ED 226 021 TM 830 037

AUTHOR Kaiser, Javaid
TITLE The Predictive Validity of GRE Aptitude Test.
PUB DATE 12 Nov 82
NOTE 22p.; Paper presented at the Annual Meeting of the Rocky Mountain Research Association (Albuquerque, NM, November 12, 1982).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Admission Criteria; *College Entrance Examinations; Computer Science Education; Education Majors; Grade Prediction; *Graduate Study; Higher Education; Multiple Regression Analysis; *Predictive Measurement; *Predictive Validity
IDENTIFIERS *Graduate Record Examinations

ABSTRACT

The continued controversy concerning the predictive validity of the Graduate Record Examination (GRE) aptitude test and its influence on selection decisions, including admission and financial aid, has necessitated the establishment of local norms. The sample involved 407 University of Kansas education and computer science students. Information on GRE verbal (GRE-V), GRE quantitative (GRE-Q), GRE verbal and quantitative, undergraduate grade point average (UGPA), graduate grade point average (GGPA), major field of study, sex, and year of enrollment were recorded. GGPA was selected as a criterion variable. The remaining variables were treated as predictors. Stepwise multiple regression was applied as a statistical tool to analyze the data. Data analysis revealed that the verbal score on GRE was the best single predictor of GGPA for education students. Based on zero-order correlations, computer science students' UGPA was a better predictor than GRE scores. The findings agree with previous studies that the GRE-V is the best single predictor of GGPA for majors that are descriptive in nature and GRE-Q is the best predictor for symbol-oriented disciplines. Tests for the equality of regression equations developed for the two student groups found significant differences, suggesting separate selection procedures in the two departments. (Author/PN)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED226021

The Predictive Validity of GRE Aptitude Test

Javaid Kaiser

University of Kansas

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

This document has been reproduced as received from the person or organization originating it.
Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Javaid Kaiser

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

TM 830 037

Paper presented at the annual meeting of the Rockey Mountain Educational Research Association at Albuquerque, New Mexico, November 12, 1982.

The Predictive Validity of GRE Aptitude Test

Like every measuring instrument, the validity and reliability of GRE aptitude test is very crucial to its continued use in graduate school. In view of the need to validate the GRE, Educational Testing Service and many individual institutions and researchers have been attempting to uncover the strengths and weaknesses of this instrument for the last two decades. The results obtained from these studies vary significantly from one another. Most of the studies have serious methodological problems such as small sample size and restriction of range on both the predictors and the criterion. There is also a controversy about what variables to be considered as a true representation of students' performance at the graduate school. Though most of the studies used grade point average (GPA) as a dependent variable, criteria like faculty ratings, time taken to complete the degree, attainment of degree, and the performance in departmental comprehensive examination have also been used in the past.

The studies that used GPA in graduate school (GGPA) as criterion are Alexakas (1967), Borg (1963), Capps and Decosta (1957), Clark (1968), Conway (1955), Department of History, UCL (1963), Duff and Aukes (1966), Eckhoff (1966), Gorman (1953), Hackman, Wiggins, and Bass (1970), Hanson (1970), Johnson and Thompson (1962), Madaus and Walsh (1965), Newman (1968), Office of Educational Research (1963), Office of institutional Analysis (1966), Office of Institutional Research and Service (1958), Olsen (1955), Roberts (1970), Robinson (1957), Roscoe and Houston (1969), Shafer and Rosenfeld (1969), Sleeper (1961), Wallace

(1952), White (1954), White (1967), and Williams, Harlow, and Grab (1970). The median r values of .24, .23, .33, and .31 were observed when GGPA was correlated with GRE verbal score (GRE-V), GRE quantitative score (GRE-Q), GRE total score (GRE-V+Q), and undergraduate GPA (UGPA), respectively based on 46, 43, 30, and 26 studies. The median R value of .45 based on 24 studies was obtained when GRE scores and UGPA were used together as a composite (Concard, Trisman, and Miller, 1977).

Bergmann (1960), Besco (1960), Duff and Aukes (1966), Harvey (1963), King and Besco (1960), Lannholm (1960), Law (1960), Michels (1966), Office of Educational Research (1963), Olsen (1955), Robertson and Hall (1964), Robertson and Nielson (1961), Test Office, Sacramento State College (1969), Tully (1962), and Wallace (1952), were identified as studies that used faculty ratings as a criterion. The median r values of .31, .27, .41, and .37 were obtained when faculty ratings were correlated with GRE-V, GRE-Q, GRE-V+Q, and UGPA, respectively based on 27, 25, 8, and 15 studies. (Concard et al., 1977).

The median r values of .18, .26, and .14 were obtained when attainment of the Ph.D., the criterion, was correlated with GRE-V, GRE-Q, and GRE-V+Q, respectively. The studies that come under this category include Bensen (1958), Creager (1965), Departmental Memo, UCL (1970), Ewen (1969), Fleury and Coppelluzzo (1969), Harmon (1966), Lannholm (1960), Roberts (1970), Rock (1974), Roscoe et al. (1969), Rupiper (1959), Voorhees (1960), and Williams, Harlow, and Grab (1970). The median multiple R of .31 for GRE V+Q and .40 for GRE-UGPA composite was obtained when attainment of Ph.D. was the dependent variable in the studies. The median r coefficients in the range of .16 to .40 were obtained when time

taken to complete Ph.D. was used as the criterion and GRE scores were the predictors.

Gorman (1953), Lorge (1960), Michael, Jones, and Gibson (1960), Michael, Jones, and others (1971), and Sistrunk (1961) used performance on departmental comprehensive examinations as the dependent variable. Concard, et al. (1977) reported median correlation of .42 and .27 for this group of studies. The median values are based on 5, and 2 studies, respectively.

All the research work done to this point revealed that GRE-V had the highest median r value (.37) when faculty ratings were used as dependent variable and the lowest median r of .16 when time taken to complete the degree was the criterion. Likewise, the lowest median r (.23) for GRE-Q was obtained with GGPA as criterion, compared to a value of .27 obtained when faculty ratings were the dependent variable. The median r (.31) for GRE-V+Q was associated with attainment of Ph.D. as the criterion while the highest value (.41) was obtained with faculty ratings. UGPA gave the highest median r (.37) with faculty ratings and the lowest value (.14) with the attainment of Ph.D. The range of multiple R for GRE-UGPA composite was .40 to .45. The maximum value was associated when GGPA was used as criterion.

Though the overall results support the use of faculty ratings as an effective criterion they, in fact, are subjective and unreliable. Departmental examinations lack generalizability over departments even within the same institution. Attainment of degree, time taken to complete the degree and like criteria are unsuitable because they are influenced as much or more by factors such as motivation, persistance,

work conditions, and financial status as academic ability. Grade point average has also been criticized because of its limited range. Graduate students generally represent a highly select group with respect to academic ability and past performance. By the time they are admitted to the graduate school, further restriction of range is introduced. It deflates the obtained coefficients and make them look lower than the national norms (ETS, 1978; Wilson, 1977). Moreover, the grades of one institution may not match the grades of another institution in terms of expertise and skill required. Many educationists doubt that even reliable grades can represent the most important outcomes of education. Though no single criterion is completely satisfactory, the use of several criteria may represent a satisfactory compromise (Concard, et al., 1977).

In terms of the best predictors available, the general consensus is that GRE-V is the best single predictor of GGPA for majors that are descriptive in nature and GRE-Q is the best predictor for symbol oriented disciplines. GRE scores and UGPA is considered the best possible composite of multiple predictors. Letters of recommendations are not considered a reliable predictor because they are subjective, generally biased, and hard to quantify. As far as overall performance of the test is concerned, it is considered a good predictor of graduate school performance for the majority group. However, serious doubts exist about its possible bias towards ethnic minorities.

Purpose of the Study

The continued controversy about the predictive validity of GRE aptitude test and its overwhelming influence on selection decesions including admission and financial aid has necessitated the establishment of local norms (Cronbach, 1971; Willingham, 1976). The present study was therefore, designed (1) to investigate the justification of continued use of the instrument for education and computer science students at the University of Kansas and (2) to develop norms for use of local officials who classify students on the basis of GRE scores. The study involved (1) the identification of the best possible set of predictors of student performance in the graduate school, (2) the development of separate regression equations for education and computer science groups, and (3) the testing of the equality of regression equations, so developed.

Procedure

All the currently active students, enrolled in the School of Education and at the Department of Computer Science whose GRE scores were available, were included in this study. This strategy resulted in 356 education and 51 computer science students. The total sample size was 407. The students who were denied admission by the two departments under consideration could not be included in this study due to non-availability of desired information. Information on GRE-V, GRE-Q, GRE-V+Q, UGPA, GGPA, major field of study (Major), sex, and Year of initial enrollment (Year) were, however, recorded on each subject. Major had two levels: (1) education and (2) computer science; sex had two

categories: (1) male, and (2) female; and Year had four levels: (1) 1974 or earlier, (2) 1975, (3) 1976, and (4) 1977 or later. GGPA was selected as a criterion variable in spite of its restriction of range limitations. The rest of the variables included in this study, were treated as predictors. Stepwise multiple regression was applied as a statistical tool to analyze the data. Nominal variables like Major, Sex, and Year were dummy coded into (n-1) independent vectors before their inclusion into the regression equation. Here, n refers to the number of levels in a variable (Kerlinger, 1977). The stability of obtained R was determined at each step in the development of the regression equation, by computing the values of shrunken R by Lord and Nicholson formula (Nicholson, 1960). The statistics reported by Concard et al. (1977) on 34,443 individuals who took the GRE test between October, 1974 and June, 1976 and intended to take education as their major was included in this study as a reference group. The statistics on this group was considered as national norms because they were representative of the entire country. A similar reference group was selected for computer science students and the statistics on it was treated as national norms. This reference group consisted of 3,922 individuals who intended to take computer science as major in graduate studies (Concard, et al., 1977).

Results and Discussion

Table 1 shows the means and standard deviations computed on each variable and their interrelationship for the education and computer science groups. It was observed that the mean performance of education students was higher on both the GRE-V and the GRE-Q than the national

norms (V=473.8; Q=473.1). However, the standard deviations of the sample were lower than the national norms (V=107; Q=116). This was to be expected because some of the low scoring individuals were denied admission and therefore, were not in the sample while the national group was unrestricted in this context. The education group for this study was, therefore, above average and more homogeneous than the national sample. The same was true for computer science group when compared with its reference group. The means on both GRE-V and GRE-Q were higher compared to national norms (V=523; Q=669). The standard deviations on the two scores were lower for this group compared to national norms (S =128; S =100). This again, can be attributed to the selection effect.

==========

Insert Table 1 here

==========

The correlation coefficients between the predictors and the criterion, obtained in this study were compared with the median r values. These median values were computed from the results of GRE validity studies completed prior to 1972 (Concard, et al., 1977). The correlation matrix of the present study revealed that the verbal scores were significantly correlated with GGPA ($p < .05$) for the education group. This coefficient was, however, lower than the median coefficient of .36 that was based on 15 studies, completed on education students. The median r coefficient obtained from 46 studies, completed on a variety of disciplines was .24. The correlation between GRE-Q and GGPA for education group was also lower than the median r coefficient of .28 obtained from 14 studies conducted on education students. The median

correlation between GRE-Q and GGPA obtained from 43 studies conducted on several fields of study was .23 and was found higher than that obtained in the present study. The median coefficient for UGPA for education students was .30 and was based on 5 students. A total of 15 studies that used different majors but UGPA as predictor lead to a median r of .37. The r values obtained for UGPA in the present study was lower than both the median values. For GRE-UGPA weighted composite, 7 studies were completed on education and a median R of .42 was obtained which is substantially higher than the value obtained in this study.

There was no summarized data available in the form of median validity coefficients for the computer science students. Therefore, the results obtained for this group in the present study, were compared with the median values obtained from studies that included engineering and applied science students as subjects. The computer science students in this study were found having lower r values than the median coefficients on GRE-V, GRE-Q, UGPA, and GRE-UGPA weighted composite. The median values for these predictors were .29, .31, .18, and .42. The first two values were based on 11 and 10 studies respectively and the last two were based on 4 studies each.

Though the correlation coefficients obtained in this study were lower than the median values on all the predictors included in this study, they were found to be stable than the coefficients used to determine such median values. The median r's were inflated due to inflated coefficients used to determine such values. Inflated values in individual studies were, however, caused by small sample size. The studies used in computing median r values had a median sample size of 80 and the

lowest sample size in such studies was 20.

After this preliminary examination, the two sets of regression equations were developed for each group. The first one included the GRE-V, GRE-Q, UGPA, sex, and year of enrollment as independent variables. In the second equation, GRE-V+Q was substituted for GRE-V and GRE-Q while the other predictors were unchanged. The order of inclusion of predictors was also the same in both situations. The analysis revealed that the GRE-V contributed most to predicting GGPA ($p < .01$) for the education group. The unique contribution of the GRE-Q over and above GRE-V was non-significant ($p > .05$). Slight increments in R were produced by UGPA and Year, but their unique contribution was insignificant ($p > .05$) over and above the predictors that were already in the equation at the time of their insertions. The impact of sex over and above GRE scores and UGPA was insignificant ($p > .05$). Similar results were obtained for the second set of analysis for the same group when GRE-V+Q was substituted for GRE-V and GRE-Q. An interesting result was that the overall predictability dropped slightly with the second equation discouraging the use of total scores on GRE as a substitute for GRE subtest scores. This finding also suggested that assigning equal weights to verbal and quantitative scores is not desirable. The GRE-UGPA weighted composite produced multiple correlation of .23 which was much lower than the median R (.45) obtained from 24 studies, completed between 1952 and 1972. The overall multiple correlation obtained for the education group was .28.

==========

Insert Table 2 here

==========

The values of the shrunken R represent the multiple correlation coefficient one would expect if the study were replicated on another sample and the regression equations developed in this study were used to predict the criterion. These estimated coefficients listed in Table 2 support the findings obtained in this study.

In spite of low correlation coefficients, it was apparent that the GRE-V is the best single predictor of GGPA for education students and that the GRE-V and UGPA form the best single composite to predict the criterion. This finding supports the earlier findings that conclude that GRE-V is the best single predictor of GGPA for disciplines that are descriptive in nature (Lannholm, 1972; Concard, et al., 1977).

For the computer science group, the order of inclusion of the predictors into the regression equation was changed from that for the education group because the correlation matrix of this group suggested the insertion of UGPA as the first predictor. GRE-V and GRE-Q were added next, but GRE-V could not meet the tolerance level and appeared as the last predictor in the equation. The predictors are listed in Table 2 in the order they appeared in the equation. In spite of high multiple correlation coefficient, none of the predictors contributed significantly to predicting the criterion ($p > .05$). The overall R was not significant ($p > .05$) at any step. High, but insignificant R values might be the result of small sample size (n=51). However, the correlation matrix for this group and multiple correlations obtained suggested that UGPA is the

best single predictor of GGPA for computer science students. In terms of multiple predictors, UGPA and GRE-Q would be the preferred composite. The values of the shrunken R supported the statement that UGPA and GRE-Q were the only potential predictors for this group.

The inference drawn earlier that the use of the GRE-V+Q lowers the overall predictability of GGPA was also found true for the computer science group. The GRE-V was the least significant predictor of GGPA for the computer science group while GRE-Q was the least significant predictor for the education group. This finding was supported by previous studies that concluded that the GRE-V is a good predictor for majors of descriptive nature and that GRE-Q is more suitable for symbol oriented disciplines (Concard, et al., 1977).

When the regression equations developed for the education and computer science groups were tested for equality, significant differences were found ($F=4.421$; $df=4, 399$; $p=.002$). The equations that were tested included GRE-V, GRE-Q, and UGPA as predictors. The findings therefore, suggest the use of separate selection procedures in the two departments.

Conclusion

The data analysis revealed that in spite of all the doubts about the GRE aptitude test and the problem of restriction of range, verbal score on GRE were the best single predictor of graduate school GPA for education students. Undergraduate GPA, sex, and year of enrollment did not increase the predictability of the criterion significantly, over and above the prediction made by verbal scores, alone. The composite of GRE verbal score and undergraduate GPA was considered as the best possible

set of multiple predictors.

For computer science students, none of the predictors contributed significantly to prediction of the criterion, at any stage of the regression analysis. However, based on zero-order correlations, it was apparent that the undergraduate GPA was a better predictior than the GRE scores.

The continued use of total scores on GRE is considered inappropriate for both the groups as it underpredicted the criterion. Test for the equality of regression equations developed for the two groups suggested separate selection procedures in the two departments.

References

Alexakos, C. E. The Graduate Record Examinations: Aptitude tests as screening devices for students in the College of Human Resources and Education. Unpublished report, West Virginia University, 1967.

Benson, W. R. Measurable and observable factors in the selective retention of doctoral candidates with special implications for industrial education. Doctoral dissertation, Wayne State University, 1958.

Bergmann, W. Relationships between scores on Graduate Record Examinations and graduate school performance in chemistry. Unpublished manuscript reported by G. V. Lannholm in Graduate Record Examinations. Special Report 60-3, Educational Testing Service, Princeton, New Jersey, 1960.

Besco, R. O. The measurement and prediction of success in graduate school. Doctoral dissertation, Purdue University, 1960.

Borg, W. R. GRE aptitude scores as predictors of GPA for graduate studies in education. Educational and Psychological Measurement, 1963, 23, 379-389.

Capps, M. P., & Decosta, F. A. Contributions of the Graduate Record Examinations and the National Teacher Examinations to the prediction of graduate school success. Journal of Educational Research, 1957, 50, 383-389.

Clark, H. Graduate Record Examination correlations with GPA in the Department of Education at Northern Illinois University, 1962-1966. Unpublished Master's thesis, Northern Illinois University, 1968.

Concard, Trisman, & Miller. GRE Manual. Princeton, N.J.: Educational Testing Service, 1977.

Conway, Sister M. T. The relationship of the Graduate Record Examination results to achievement in the Graduate School at the University of Detroit. Unpublished Master's thesis, University of Detroit, 1955.

Creager, J. A. Predicting doctoral attainment with GRE and other variables. Technical Report No. 25, NAS-NRC, Washington, D. C., 1965.

Cronbach, L. J. Test Validation. In R. L. Thorndike (Ed.). Educational Measurement (2nd. ed.). Washington, D. C.: American Council on Education, 1971.

Department of History. Preliminary review of results. Department memo, Department of History, University of California, Berkeley, 1963.

Duff, F. L., & Aukes, L.E. The relationship of the GRE to success in the graduate college. Bureau of Institutional Research and Office of Instructional Research, University of Illinois, 1966.

Eckhoff, C. M. Predicting graduate success at Winona College. Educational and Psychological Measurement, 1966, 26, 483-485.

Educational Testing Service, Guide to the use of the GRE, 1978-79. Princeton, N. J.: ETS, 1978.

Ewen, R. B. The GRE psychology test as an unobtrusive measure of motivation. Journal of Applied Psychology, 1969, 53, 383-387.

Fleury, B. J., & Cappelluzzo, E. M. Educational research training programs: Requirements for admission research training programs. School of Education, University of Massachusetts, 1969.

Gorman, A. The validation of the Miller Analogies Test and the Graduate Record Examinations for the selection of graduate psychology students at New York University. Unpublished Master's thesis, New York University, 1953.

Hackman, J. R., Wiggins, N., & Bass, A. R. Prediction of long-term success in doctoral work in psychology. Educational and Psychological Measurement, 1970, 30, 365-374.

Hansen, W. L. Prediction of graduate performance in economics. Department of Economics, University of Wisconsin, 1970 (Mimeograph).

Harmon, L. R. Fourteen years of research on fellowship selection. NAS-NRC, Washington, D. C., 1966.

Harvey, P. R. Predicting graduate school performance in education. Unpublished report, Educational Testing Service, Princeton, N. J., 1963.

Johnson, H., & Thompson, E. The Graduate Record Examination at Sacramento State College. Technical Bulletin # 11, Student Personnel Division, Sacramento State College, 1962.

Kerlinger, F. N., & Pedhazer, E. J. Multiple Regression in Behavioral Research. New York: Holt, Rinehart, and Winston, 1973.

King, D. C., & Besco, R. O. The GRE as a selection device for graduate research fellows, Educational and Psychological Measurement. 1960, 20, 853-856.

Lannholm, G. V. Abstracts of selected studies of the relationship between scores on the GRE and graduate school performance. GRE Special Report 60-3, ETS, Princeton, N. J., 1960.

Lannholm, G. V. Summaries of GRE validity studies: 1966-1970 (GRE Rep. 72-1). ETS, Princeton, N. J., 1972.

Law, A. The prediction of ratings of students in a doctoral training program, Educational and Psychological Measurement. 1960, 20, 847-851.

Lorge, I. Relationship between Graduate Record Examinations and Teachers College, Columbia University, Doctoral Verbal Examinations. Letter to G. V. Lannholm, dated September 21, 1960.

Madaus, G. F., & Walsh, J. J. Departmental differentials in the predictive validity of the Graduate Record Examinations aptitude tests. Educational and Psychological Measurement, 1965, 25, 1105-1110.

Michael, W. B., Jones, R. A., Al-Amir, H., Pullias, C. M., Jackson, M., & Goo, V. Correlates of a pass-fail decesion for admission to candidacy in a doctoral program. Educational and Psychological Measurement, 1971, 31, 965-967.

Michael, W. B., Jones, R. A., & Gibbon, B. D. The prediction of success in graduate work in chemistry from scores on the Graduate Record Examinations. Educational and Psychological Measurement, 1960, 20, 859-861.

Michels, W. C. Graduate Record Examination advance physics test as a predictor of performance, American Journal of Physics, 1966, 34, 862-866.

Newman, R. I. GRE scores as predictors of GPA for psychology graduate students. Educational and Psychological Measurement, 1968, 28, 433-436.

Nicholson, G. E. Prediction in future samples. In I. Olkin and others (Eds.). Contributions to Probability and Statistics. Stanford, Calif.: Stanford University Press, 1960.

Office of Educational Research. Study of GRE scores of geology students matriculating in the years 1952-1961. RP- Abstract, Yale University, 1963.

Office of Institutional Analysis. Correlations between admission criterion and University of Virginia GPA's. Graduate School of Arts and Sciences, University of Virginia, 1966 (Mimeograph).

Office of Institutional Research and Service. Relationship between Graduate Record Examinations aptitude test scores and academic achievement in the graduate school at Florida State University. Florida State University, 1958, 68pp.

Olsen, M. The predictive effectiveness of aptitude test and the advance biology test of the GRE in the Yale School of Forestry. Statistical Report 55-6, Educational Testing Service, Princeton, N. J., 1955.

Roberts, P. T. An analysis of the relationship between GRE scores and success in the graduate school of Wake Forest University. Unpublished Master's thesis, Wake Forest University, 1970.

Robertson, M., & Hall, E. Predicting success in graduate study. The Journal of General Psychology, 1964, 71, 359-365.

Robertson, M., & Nielson, W. The GRE and the selection of graduate students. American Psychologist, 1961, 26, 648-650.

Robinson, D. W. A comparison of two batteries of tests as predictors of first year achievement in the graduate school of Bradley University. Doctoral dissertation, Bradley University, 1957.

Rock, D. A. The prediction of doctorate attainment in psychology, mathematics, and chemistry. GRE Board Research Report 69-6AR. Princeton, N.J.: ETS, 1974.

Roscoe, J. T., & Houston, S. R. The predictive validity of GRE scores for a doctoral program in education. Educational and Psychological Measurement, 1969, 29, 507-509.

Rupiper, O. J. An analysis of the Graduate Record Examinations for doctoral majors in education. Peabody Journal of Education, 1959, 36, 270-290.

Shaffer, J., & Rosenfeld, H. MAT-GRE prediction study---Initial results. Intradepartmental memorandum, Department of Psychology, University of Kansas, 1969.

Sistrunk, F. The GRE's as predictors of graduate school success in psychology. Letter to G. V. Lannholm, dated October 3, 1961.

Sleeper, M. L. Relationships of scores on the GRE to GPA's of graduate students in occupational therapy. Educational and Psychological Measurement, 1961, 21, 1039-1040.

Test Office, Sacramento State College. An analysis of traditional predictors variables and various criteria of success in the Master's degree program at Sacramento State College for an experimental group who received Masters' degrees in the spring, 1968 and a comparable control group who withdrew from their programs. Test Office Report 69-3, Sacramento State College, 1969.

Tully, G. E. Screening applicants for graduate study with the aptitude test of the Graduate Record Examinations. College and University, 1962, 38, 51-60.

Voorhees, H. R. Relationship between scores on Graduate Record Examination and graduate school performance in physics. Unpublished manuscript reported by G. V. Lannholm in Graduate Record Examinations. Special Report 60-3, ETS, Princeton, N. J., 1960.

Wallace, A. D. The predictive value of the Graduate Record Examinations at Howard University. Unpublished Master's thesis, Howard University, 1952.

White, E. L. The relationship of the Graduate Record Examinations' results to achievement in the graduate school at the University of Detroit. Unpublished Master's thesis, University of Detroit, 1954.

White, G. W. A predictive validity study of the Graduate Record Examinations aptitude test at the University of Iowa. Unpublished Master's thesis, University of Iowa, 1967.

Williams, J. D., Harlow, S. D., & Grab, D. A longitudinal study examining prediction of doctoral success: GPA as criteria of graduation vs. non-graduation as criterion. Journal of Educational Research, 1970, 64, 161-164.

Willingham, W. W. Validity and the Graduate Record Examinations. Princeton, N. J.: ETS, 1976.

Wilson, K. H. GRE cooperative validity studies project: Extended progress report (No. 75-8). Unpublished report to the GRE Board Research Committee, 1977.

TABLE 1

Sample size, $\bar{X}$, SD and correlation for Education Majors and Computer Science Majors on 4 predictors and the criterion

Major		GRE-V	GRE-Q	GRE-V+Q	UGPA	GGPA	N	$\bar{X}$	SD
Education	1	--	.41**	.80**	.15	.21*	356	524.94	94.59
	2		--	.86**	.20*	.11		500.90	110.55
	3			--	.22*	.19		1024.55	172.92
	4				--	.12		3.02	0.51
	5					--		3.65	0.36
Computer Science	1	--	.26**	.87**	.08	.05	51	604.51	96.59
	2		--	.70**	.07	.17		694.31	66.67
	3			--	.04	.12		1298.82	131.11
	4				--	.27**		3.20	0.48
	5					--		3.51	0.48

*P ≤ .05
**P ≤ .01

Table About R, R^2, $\hat{R}$ and Their Tests of Significance

Major	Set	Variables	R	R^2	$\hat{R}$	Test of Overall Significance df	F	Test of Increment in R df	F
EDUCATION	SET 1	GRE-V	.21	.04	.18	1,354	15.66**	1,354	15.66**
		GRE-Q	.21	.04	.17	2,353	8.01**	1,353	0.39
		UGPA	.23	.05	.18	3,352	6.27**	1,352	2.71
		SEX	.23	.05	.16	4,351	4.71**	1,351	0.07
		YOE	.28	.09	.21	8,347	4.16**	4,347	3.48
	SET 2	GRE-V+Q	.19	.03	.16	1,354	12.63**	1,354	12.63**
		UGPA	.20	.04	.17	2,353	7.56**	1,353	2.45
		SEX	.21	.04	.15	3,352	5.17**	1,352	0.40
		YOE	.28	.08	.20	7,348	4.31**	4,348	3.28
COMPUTER SCIENCE	SET 1	UGPA	.27	.07	.13	1,49	3.81	1,49	3.81
		GRE-Q	.31	.10	.06	2,48	2.56	1,48	1.29
		SEX	.35	.12	+	3,47	2.20	1,47	1.44
		YOE	.48	.23	+	7,43	1.84	4,43	1.50
		GRE-V	.48	.23	+	8,42	1.58	1,42	0.01
	SET 2	UGPA	.27	.07	.13	1,49	3.81	1,49	3.81
		GRE-V+Q	.29	.08	+	2,48	2.15	1,48	0.53
		SEX	.33	.11	+	3,47	1.95	1,47	1.49
		YOE	.46	.21	+	7,43	1.70	4.43	1.45

* $P \leq .05$
** $P \leq .01$
\+ $\hat{R} \leq 0$
$\hat{R}$ = Estimated shrunken R based on Lord Nicholson formula